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Final report: NAGW - 3826

Closure date: July 1998 (under a no cost extension)

Last activity: Currently active, March 1998

Project title: Satellite-based investigations of the transition from an oceanic to continental transform margin....

Scope of Project: This grant supports image processing and geologic field studies to characterize modern faulting in the Valle de San Felipe, Baja California, Mexico.

Summary of research accomplishments: Detailed characterization of neotectonics evolution of the Valle de San Felipe and Arroyo Grande regions in northern Baja California. Reoccupied GEOMEX GPS sites. and occupied a regional GPS (Global Positioning System) network.

Project summary:

The Baja California peninsula in Mexico offers a unique setting for studying the kinematic evolution of a complex, active strike-slip/rift plate boundary. We are currently conducting remote sensing, geologic, and geodetic studies of this boundary. The combined data sets will yield instantaneous and time integrated views of its evolution. This proposal solicits renewed funding from NASA to support remote sensing and geologic studies.

During the late Cenozoic, Baja California has been the locus of changing fault geometry that has accommodated components of the relative motion between the North America and Pacific plates. Contemporary slip between the two plates occurs in a broad zone that encompasses much of southern California and the Baja California Peninsula. The transfer of slip across this zone in southern California is relatively well understood. South of the border, the geometry and role of specific faults and structural provinces in transferring plate margin deformation across the peninsula is enigmatic.

Results

We use Landsat Thematic Mapper imagery of the Baja California Peninsula to identify recent and active faults, and then conduct field studies that characterize the temporal and spatial structural evolution of the plate margin. These data address questions concerning the neotectonic development of the Gulf of California, the Baja California Peninsula, and their role in evolution of the post-Miocene Pacific - North American plate boundary. Moreover, these studies provide constraints on the geometry of active faults, allowing more exact understanding of the results of ongoing NASA-supported geodetic experiments. In addition, anticipated publication of the TM scenes will provide a widely available geological data base for relatively little-known peninsular California.

Achievements include development of an ArcInfo data base of Landsat and SPOT imagery, detailed field studies of Neogene structures in northeastern Baja California, and new constraint on Pacific - North America plate motion at Baja California latitudes. These results are reported in maps, manuscripts and data products which are published or near completion.

Inventions

No inventions have resulted from the performance of this research.

Bibliography:

PAPER:

Jeffrey Lee, M. Meghan Miller Robert Crippen, Bradley Hacker, and Jorge Ledesma-Vazquez, in review, Middle Miocene Extension in the Gulf Extensional Province, Baja California: Evidence from the southern Sierra Juarez: Geological Society of America Bulletin.

ABSTRACTS:

- J. Lee and M. M. Miller, 1994, Middle Miocene extension in the Gulf Extensional Province, Baja California, Mexico: Geochronologic evidence from the southern Sierra Juarez: Geological Society of America Abstracts with Programs, v. 26, p. A65.
- F. Farina, T. Dixon, F. Suarez, E. Humphreys, and M. Miller, 1994, Preliminary GPS results bearing on motion of the Agua Blanca fault zone, Baja California, Mexico. Eos, Transactions, American Geophysical Union, v. 75, p. 182.
- J. Lee and M. M. Miller, 1993, Cenozoic extension along the southeastern Sierra Juarez range front, northeastern Baja California. Sociedad Geological Peninsular Meeting, Ensenada, Baja California.
- T. M. Grover, R. Heath, C. Walls, M. M. Miller, and C. M. Rubin, 1993, Evidence for active faulting in Valle de San Felipe, northern Baja California, Mexico: Space-based observations of the transition from an oceanic to continental transform boundary. Geological Society of America Abstracts with Programs, v. 25, 481.
- J. M. Stock, M. Meghan Miller, Claudia J. Lewis, Arturo Martin B., 1993, Estudios tectonicos y vulcanologicos de la Provincia Volcanica de Puertecitos, NE de Baja California, utilizando datos de Landsat (Mapeador Tematico): UGM November 1993.

Plus:

One map in press (GSA).

One Master's Thesis in review by Graduate Office.

Two undergraduate Senior Theses, to be completed by September, 1998.

Two manuscripts in preparation.